User manual

ADA-4044H
HUB RS-485 / RS-422

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Contents

1. GENERAL INFORMATION....3
1.1. WARRANTED INFORMATION....3
1.2. GENERAL CONDITIONS FOR SAFE USE....3
1.3. CE LABEL....3
1.4. ENVIRONMENTAL PRESERVATION....3
1.5. SERVICE AND MAINTENANCE....3
2. PRODUCT INFORMATION....3
2.1. PROPERTIES....3
2.2. DESCRIPTION....4
2.1. ISOLATION....5
3. INSTALLATION....5
3.1. ASSEMBLING....5
3.2. CONNECTION TO RS485/RS422 BUS....5
3.2.1. STAR TYPE CONNECTION FOR 4-WIRE RS485 BUS – CONFIGURATION OF 2-PORT RS485-OUT....5
3.2.2. STAR TYPE CONNECTION FOR 2-WIRE RS485 BUS – CONFIGURATION OF 4-PORT RS485-OUT....7
3.2.3. STAR TYPE CONNECTION FOR DEVICES WITH RS422 INTERFACE – CONFIGURATION OF 2-PORT RS485-OUT 10
3.3. LINE TERMINATION Rt....11
3.4. POWER SUPPLY....11
4. CONFIGURATION....11
4.1. OPERATING MODE SETTING....11
4.2. SETTING OF THE TYPE & NUMBERS RS485 OUT-PORTS....12
4.3. DEFAULT SETTING....12
5. STARTUP....13
5.1. SIGNALING LEDS....13
5.2. PROBLEMS....13
6. VERSIONS....13
7. SPECIFICATION....14

1. GENERAL INFORMATION

Thank you for your purchase of **CEL-MAR Company** product. This product has been completely tested and is covered by a two year warranty on parts and operation from date of sale.
If any questions or problems arise during installation or use of this product, please do not hesitate to contact Technical Support at +48 41 362-12-46 or e-mail support@cel-mar.pl.

1.1. WARRANTED INFORMATION

The **ADA-4044H HUB** is covered by a two year warranty from date of sale. In case of being damaged it will be repair or the damaged component will be replace. The warranty does not cover damage caused from improper use, materials consumption or any unauthorized changes. If the product does not function (is damaged), or not operate in accordance with the instructions, will be repaired or replaced.
All warranty and no warranty repairs must be returned with paid transport and insuring to the **CEL-MAR Company.**
CEL-MAR Company under no circumstances won't be responsible for ensuing damage from improper using the product or as a result of random causes: the lightning discharge, the flood, the fire and the like.
CEL-MAR Company is not be held responsible for damages and loss including: loss of profits, loss of data, pecuniary losses ensuing from using or the impossibility of using this product.
In specific cases **CEL-MAR Company** discontinue all warranties and in particular do not follow the user manual and do not accept terms of warranty by the user.

1.2. GENERAL CONDITIONS FOR SAFE USE

The device should be installed in a safe and stable places (eg, electroinstallation cabinet), the powering cable should be arranged so as not to be exposed to trampling, attaching, or pulling out of the circuit.
Do not put device on the wet surface.
Do not connect devices for nondescript powering sources,
Do not damage or crush powering wires.
Do not make connection with wet hands.
Do not adapt, open or make holes in casings of the device!
Do not immerse device in water or no other liquid.
Do not put the fire opened on device sources: candles, an oil lamps and the like.
Complete disable from the supply network is only after disconnecting the power supply circuit voltage.
Do not carry out the assembly or dis-assembly of the device if it is enabled. This may result to short circuit and damage the device.

1.3. CE LABEL

CE symbol on organizing the company CEL-MAR a conformity of the device to the directive of the electromagnetic EMC 89/336/EWG compatibility means (Electromagnetic Compatibility Directive). The declaration of the agreement is accessible through the contact with the technical service at the address e-mail: suppor@cel-mar.pl or on the phone at the +48 41 362-12-46.

1.4. ENVIRONMENTAL PRESERVATION

This sign on the device inform about putting expended device with other waste materials. Device should send to the recycling. (In accordance with the act about the Electronic Appliance Expended from day 29 of July 2005)

1.5. SERVICE AND MAINTENANCE

The ADA-4044H HUB does not require the servicing and maintenance.
Technical support is available at number +48 41 362-12-46 in 8.00-16.00, from Monday to Friday or e-mail support@cel-mar.pl.

2. PRODUCT INFORMATION

HUB is delivered with: user manual and terminators Rt=120 Ω - 6 pcs.

2.1. PROPERTIES

- Operating on 2-wire or 4-wire bus in RS485/RS422 standard,
- 4 ports of RS485(2W) 2-wire or 2 ports RS485(4W) 4 wire – configured by microswitch,
- Possibility of star topology on RS485 bus,
- Separation of RS485 bus segments,
- Extending the RS485/422 bus by a further segments of 1200m,
- Signal amplification of RS485/RS422 interface,
- Possibility of connection: 64 devices to RS-485-OUT(4-wire RS485 bus) or 128 devices to RS-485-OUT(2-wire RS485 bus),
- Possibility of connection 2 addressable devices with RS422 interface to RS485-OUT ports,
- Baud rate up to 230,4 kbps,
- Transparent for all protocols: MODBUS, DNP, PROFIBUS and other,
- Power supply 10 - 30 VDC stable,
- 3kV= optoizolation in signal channel between RS485/422 (RS485-IN) and RS485/422 (RS485-OUT),
- 1kV= or 3kV= galvanic isolation between RS485/422 (RS485-IN) interface and power supply,
- Screw terminal block connectors for all connections,
- Integrated short circuit protection and over-voltage protection on RS485/RS422 lines,
- Protection against power supply reverse connection,
- DIN 43880 standard - mounting in typical electro-installation unit,
- Rail mounting according to DIN35 / TS35 standard,
- Dimensions (W x D x H) 53mm x 58mm x 90mm.

2.2. DESCRIPTION

The ADA-4044H HUB is used for creation star-branches from the main bus and also separation and extending of RS485/RS422 bus for next segment 1200m without interfering with the format of transmitted data. The HUB has one input RS485 port (RS485-IN) for connection of main bus and 4 separated output ports for connection of 2-wire bus or 2 ports for connection of 4-wire of RS485/422 bus. To each output port can be connected a RS485 bus branch, having up to 32 devices. The setting of a port type is made, by the use of a RS-485 PORTS microswitch, located on the front panel. HUB ADA-4044H can be used for communication in star-topology with devices in different location and distance, where RS485 chain-topology is difficult or impossible.
To RS-485-OUT ports can be connected up to 64 devices in case of 4-wire RS485 bus, 128 devices in case of 2-wire RS485 bus and 2 addressable devices RS422.
ADA-4044H baud rate is up to 230,4 kbps via 4 or 2 pairs or twisted pair connected to screw terminal block. To 2-wire RS485 bus can be connected devices operate in half duplex mode and to 4-wire operate in half duplex & full duplex mode. It can be PLC, measuring devices, electronic scale and cash registers with RS485 or RS422 interfaces.
A surge protection on each RS485/RS422 line was made on the basis of surge diodes and fuses.

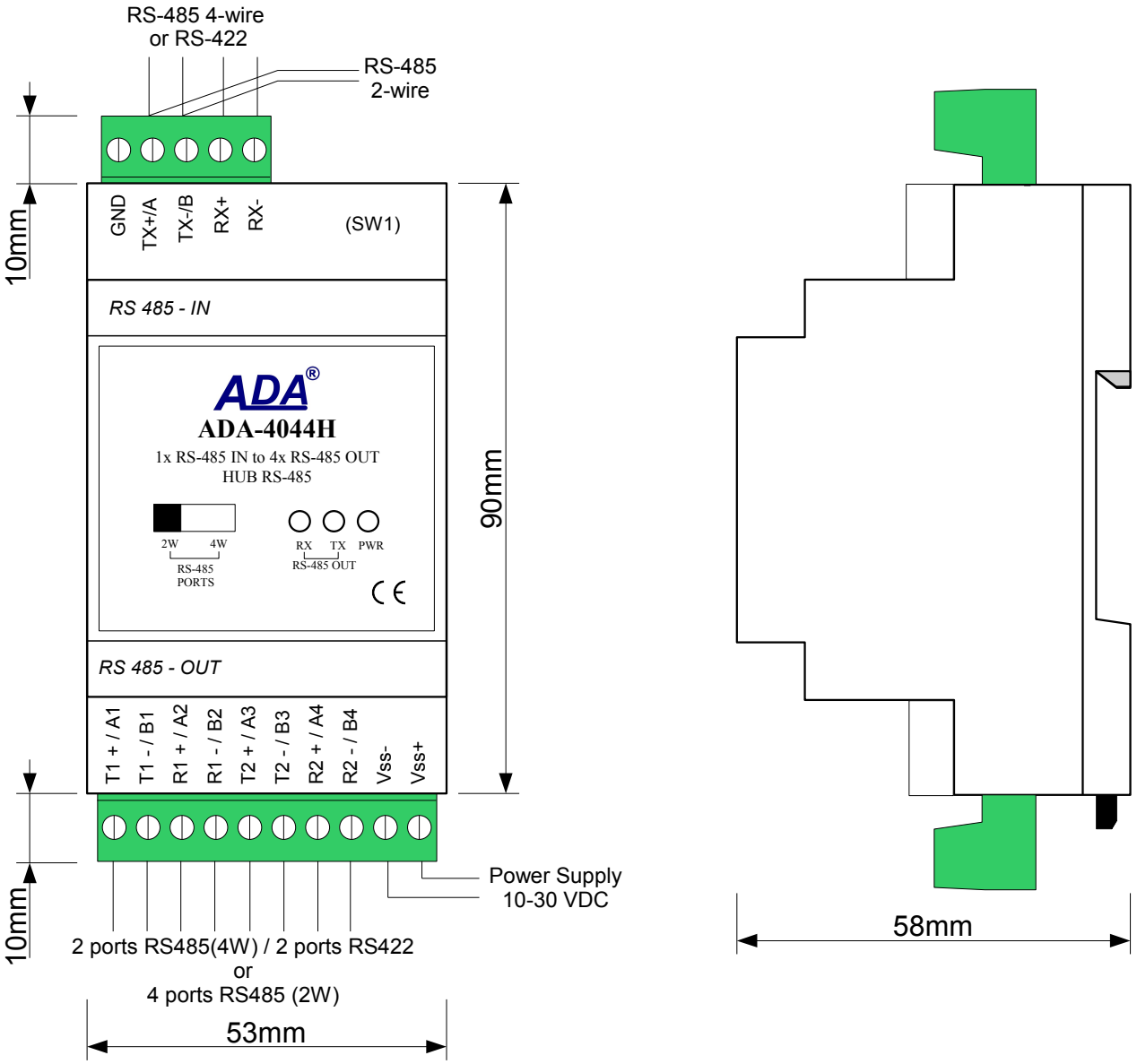

Fig 1. ADA-4044H view and location of SW1 switch

2.1. ISOLATION

HUB ADA-4044H has 2-way or 3-way, 1kV= or 3kV= galvanic isolation (depend on version). Versions are described in section *VERSIONS*.

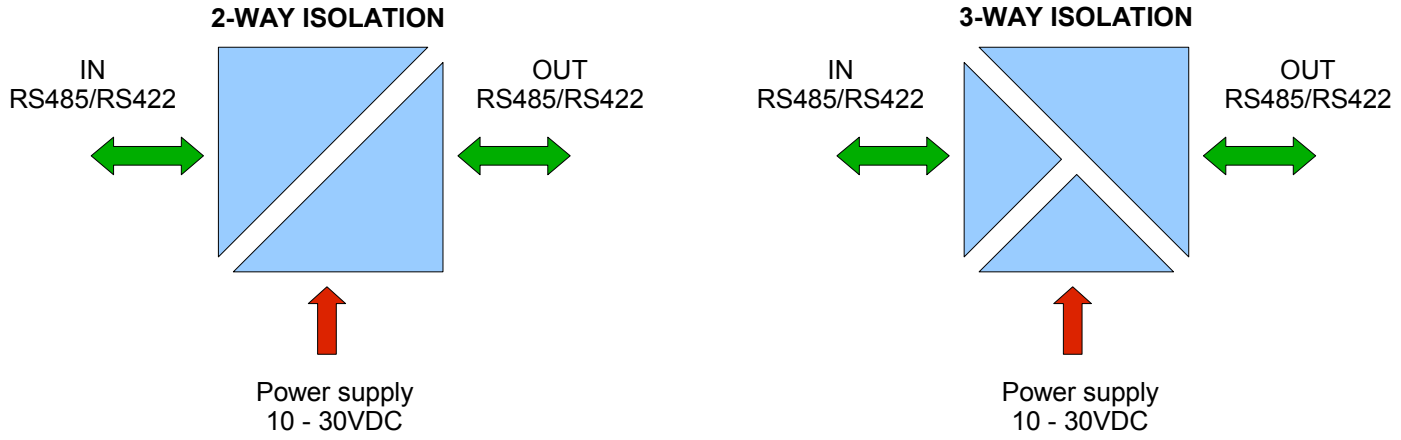

Fig 2. Insulation structure

3. INSTALLATION

This chapter will show how to connect ADA-4044H to RS485/422 bus and power supply and how to use it.
To reduce disturbance from environment, it is recommended to:

- use multipair type shielded cables, which shield can be connected to the earthing on one end of the cable,
- use the suitable diameter cable for power supply on account of voltage drop,
- use the powering cable with a suitable section because of the voltage drops,
- use the interference eliminators for powering the converter,
- lay signal cables at a distance of not less than 25 cm away from power cables,
- not powering the converters form the power-circuit of devices generate large impulse disturbance like contactors, relays, inverters.

3.1. ASSEMBLING

ADA-4044H converter case is adapted to assembly on TS-35 (DIN35) rail. To install converter should mount device on the rail upper part of the case then press bottom part to to hearing characteristic „Click” sound.

3.2. CONNECTION TO RS485/RS422 BUS

RS485/RS422 interface at ADA-4044H is available on terminal block described as: Tx+/A, Tx-/B, Rx+, Rx- (IN) and T1+/A1, T1-/B1, R1+/A2, R1-/B2, T2+/A3, T2-/B3, R2+/A4, R2-/B4 (OUT). Both buses need proper cabling.
Connection the GND terminal of RS485/422 interfaces, connected devices to RS485/422 bus, should be done in case of potential difference, which makes data transmission is improper .

3.2.1. STAR TYPE CONNECTION FOR 4-WIRE RS485 BUS – CONFIGURATION OF 2-PORT RS485-OUT

Using the ADA-4044H configured for operating with 2-port, 4-wire RS485 (the microswitch RS-485 PORT in position 4W), it's possible to:
- connect up to 64 devices with 4-wire RS485 interface in 'star',
- extend the main bus by a further segments of 1200m,
- separate other segments of bus from main network – what increases the operational reliability,
- amplify the RS485 signal.

During the connecting, pay attention to the proper implementation of the connection according to the following drawings.

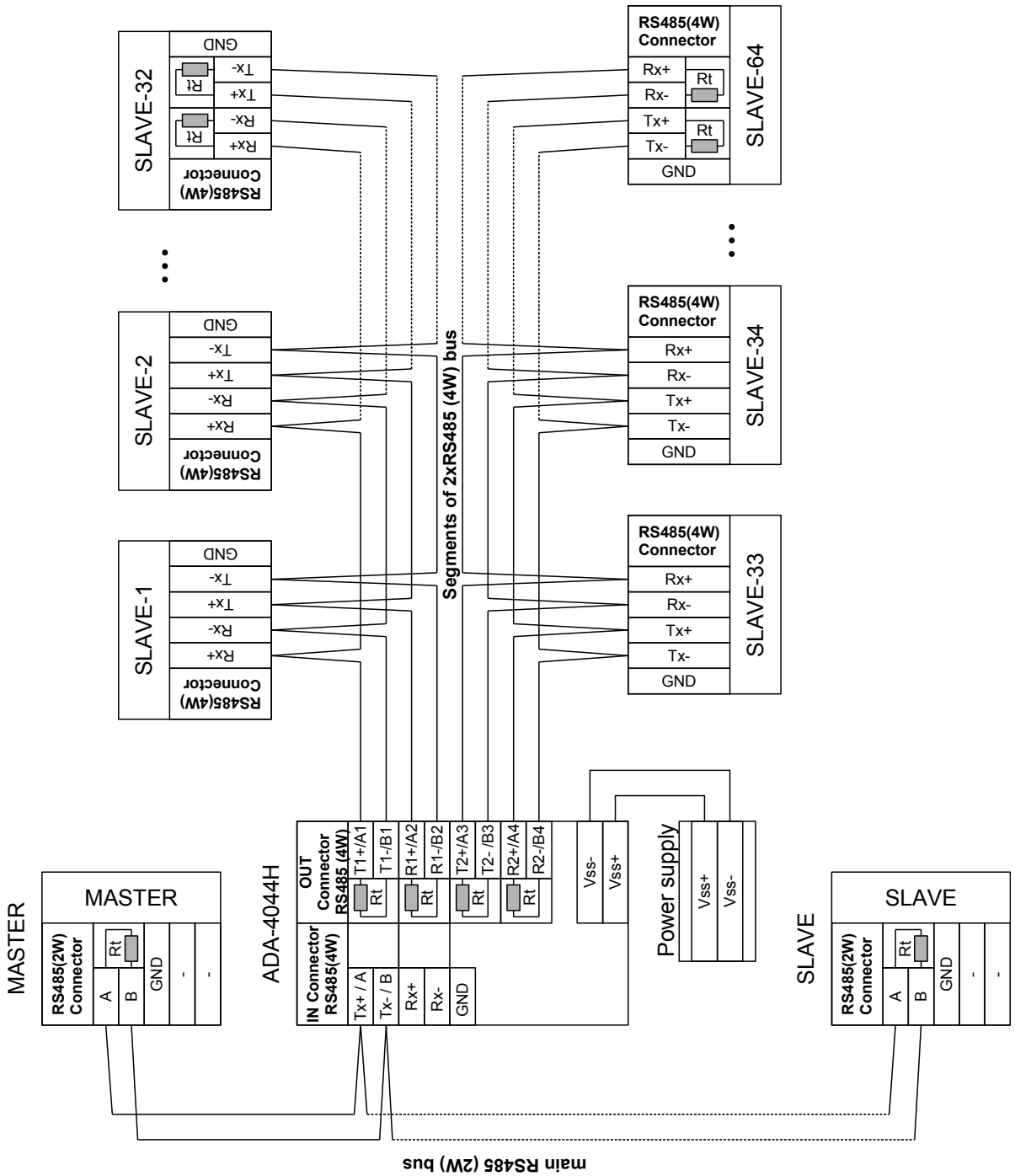

Fig. 3. Star type connection of devices with 4-wire RS485 interface to main 2-wire RS485 bus. Conversion of 2-wire bus to 4-wire bus, device separation from main 2-wire bus, extending the main bus by a further segments of 1200m, signal amplification, possibility of connection additional 64 devices.

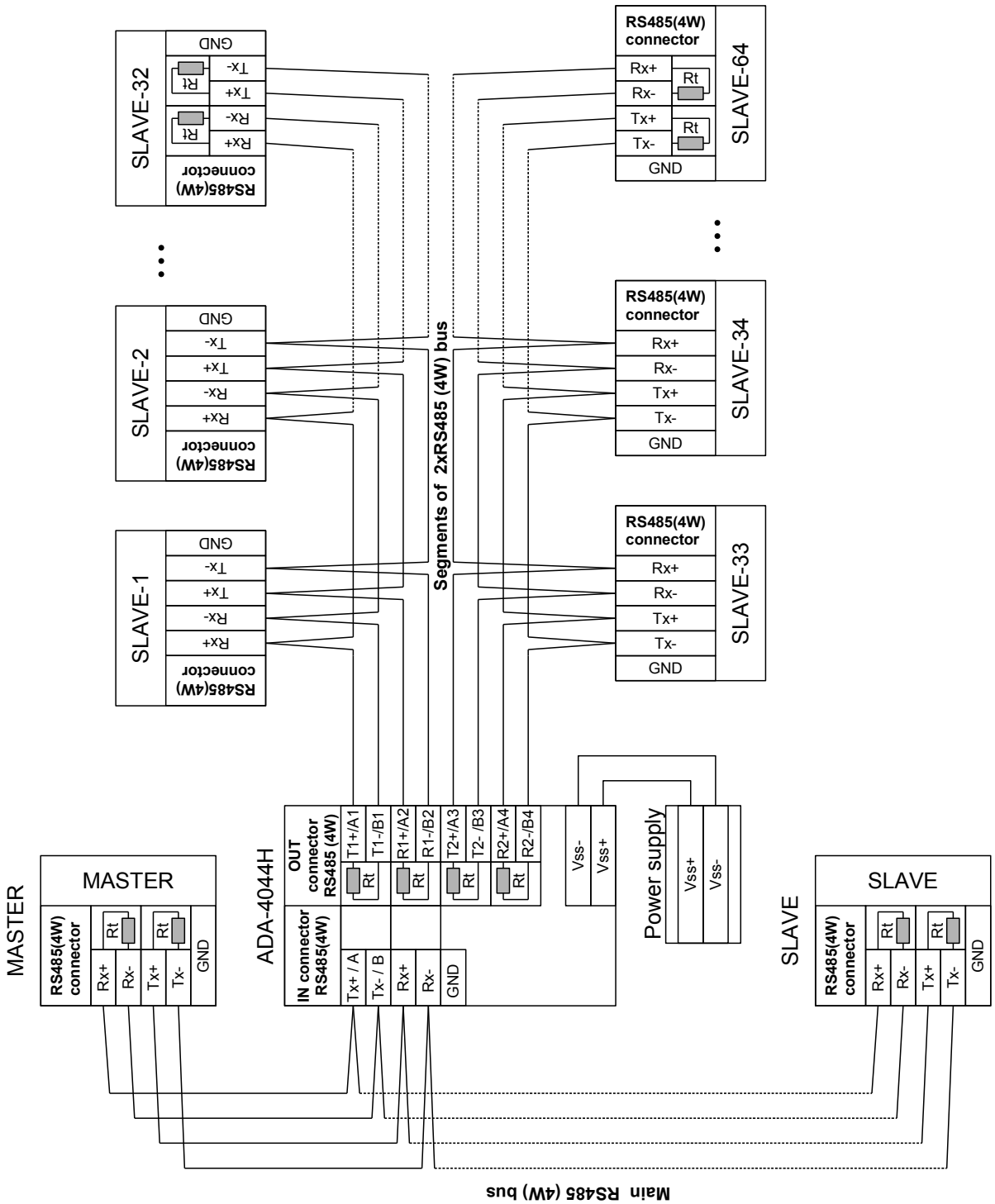

Fig. 4. Star type connection of devices with 4-wire RS485 interface to main 4-wire RS485 bus. Device separation from main 4-wire bus, extending the main bus by a further segments of 1200m, signal amplification, possibility of connection additional 64 devices.

3.2.2. STAR TYPE CONNECTION FOR 2-WIRE RS485 BUS – CONFIGURATION OF 4-PORT RS485-OUT

Using the ADA-4044H configured for operating with 4-port, 2-wire RS485 (the microswitch RS-485 PORT in position 2W), it's possible to:

- connect up to 64 devices with 4-wire RS485 interface in 'star',
- extend the main bus by a further segments of 1200m,
- separate other segments of bus from main network – what increases the operational reliability,
- amplify the RS485 signal.

During the connecting, pay attention to the proper implementation of the connection according to the following drawings.

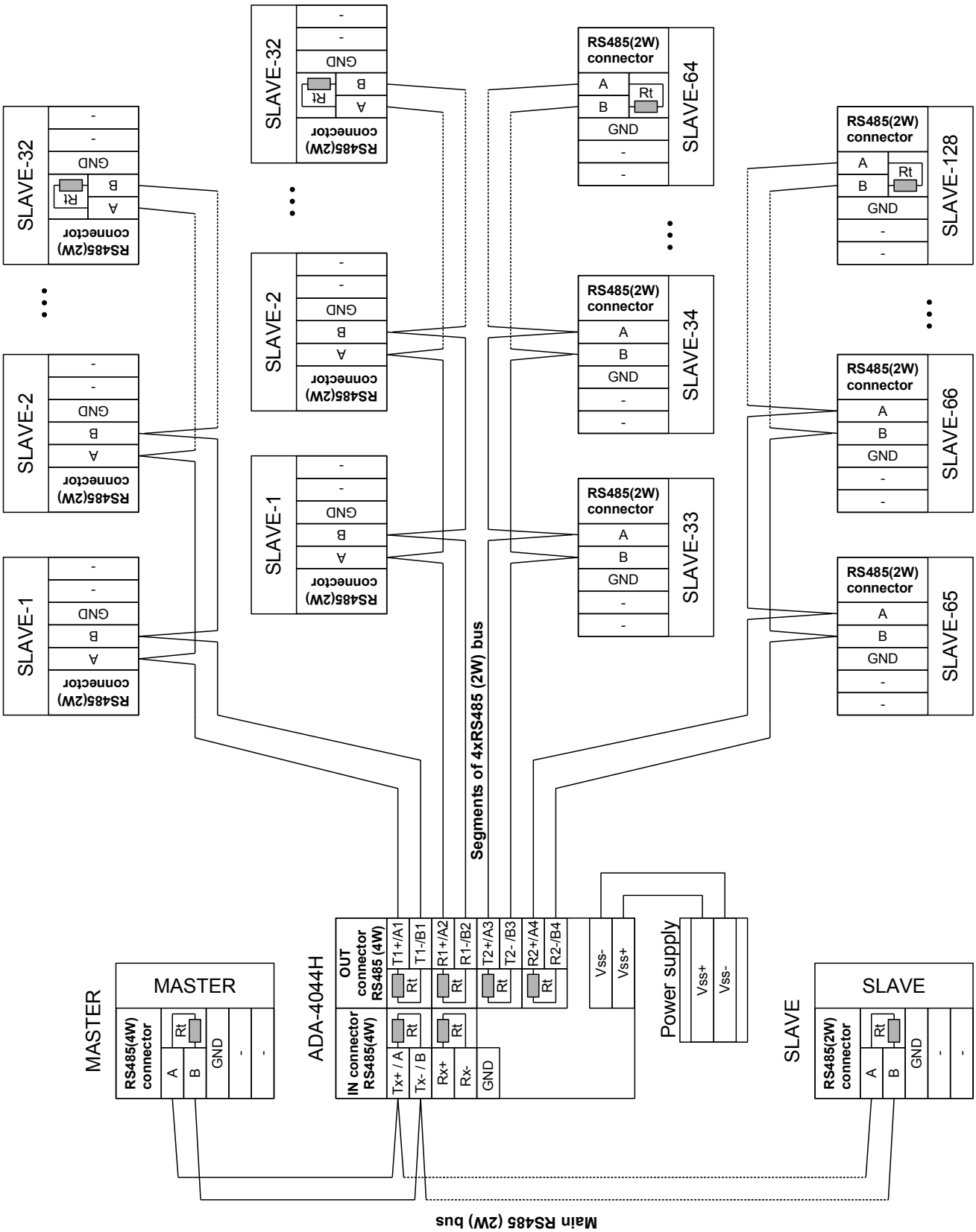

Fig. 5. Star type connection of devices with 2-wire RS485 interface to main 2-wire RS485 bus. Device separation from main 2-wire bus, extending the main bus by a further segments of 1200m, signal amplification, possibility of connection additional 128 devices.

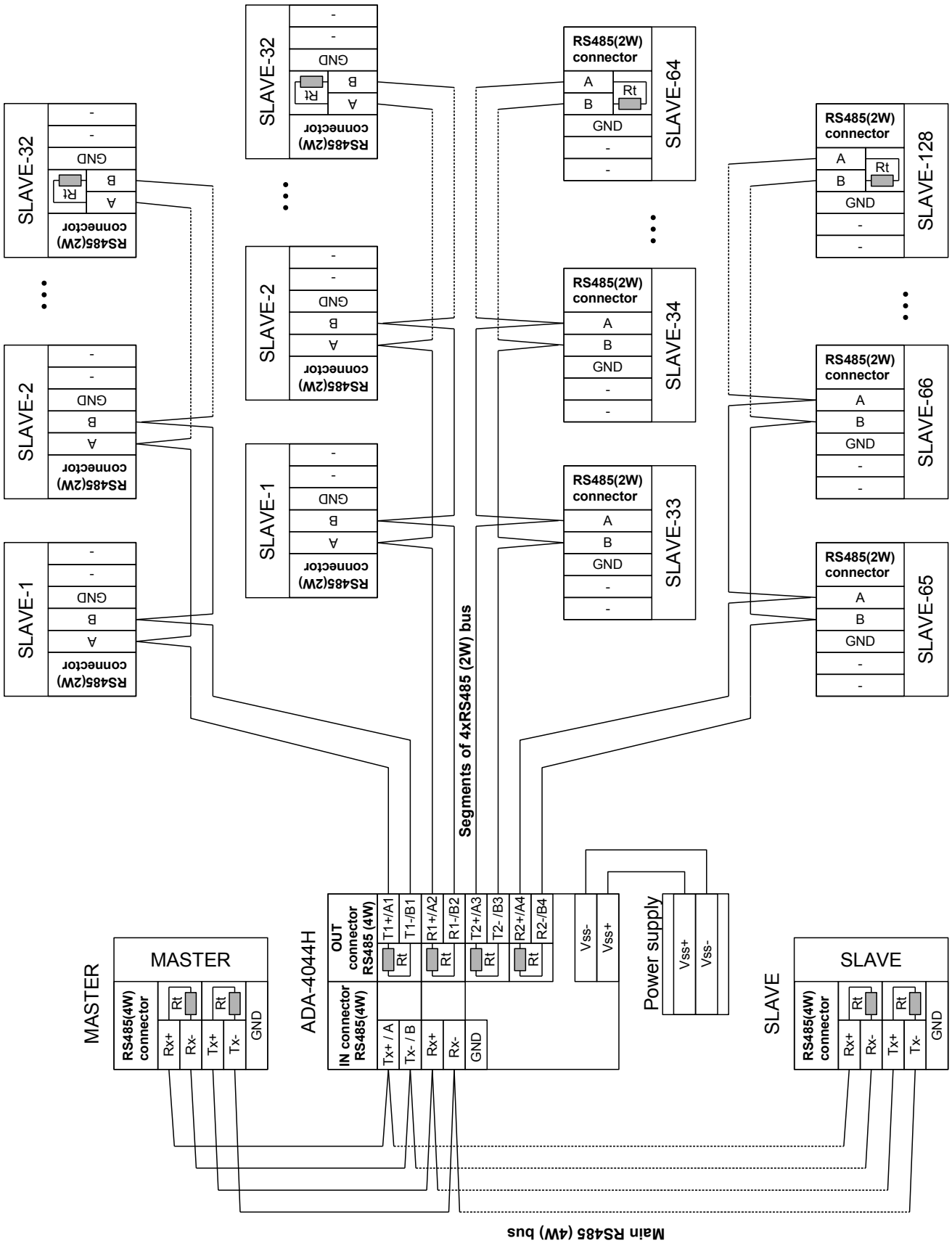

Fig. 6. Star type connection of devices with 2-wire RS485 interface to main 4-wire RS485 bus. Device separation from main 4-wire network, extending the main bus by a further segments of 1200m, signal amplification, possibility of connection additional 128 devices.

3.2.3. STAR TYPE CONNECTION FOR DEVICES WITH RS422 INTERFACE – CONFIGURATION OF 2-PORT RS485-OUT

Using the ADA-4044H, configured for operating with 2-port, 4-wire RS485 (the microswitch RS-485 PORT in position 4W), it's possible to:
- connect 2 devices with 4-wire RS422 interface to 2-wire and 4-wire RS485 bus,
- separate other segments of RS422 bus from main network – what increases the operational reliability,
- convert RS485 to RS422 interface and inversely.

During the connecting, pay attention to the proper implementation of the connection according to the following drawings

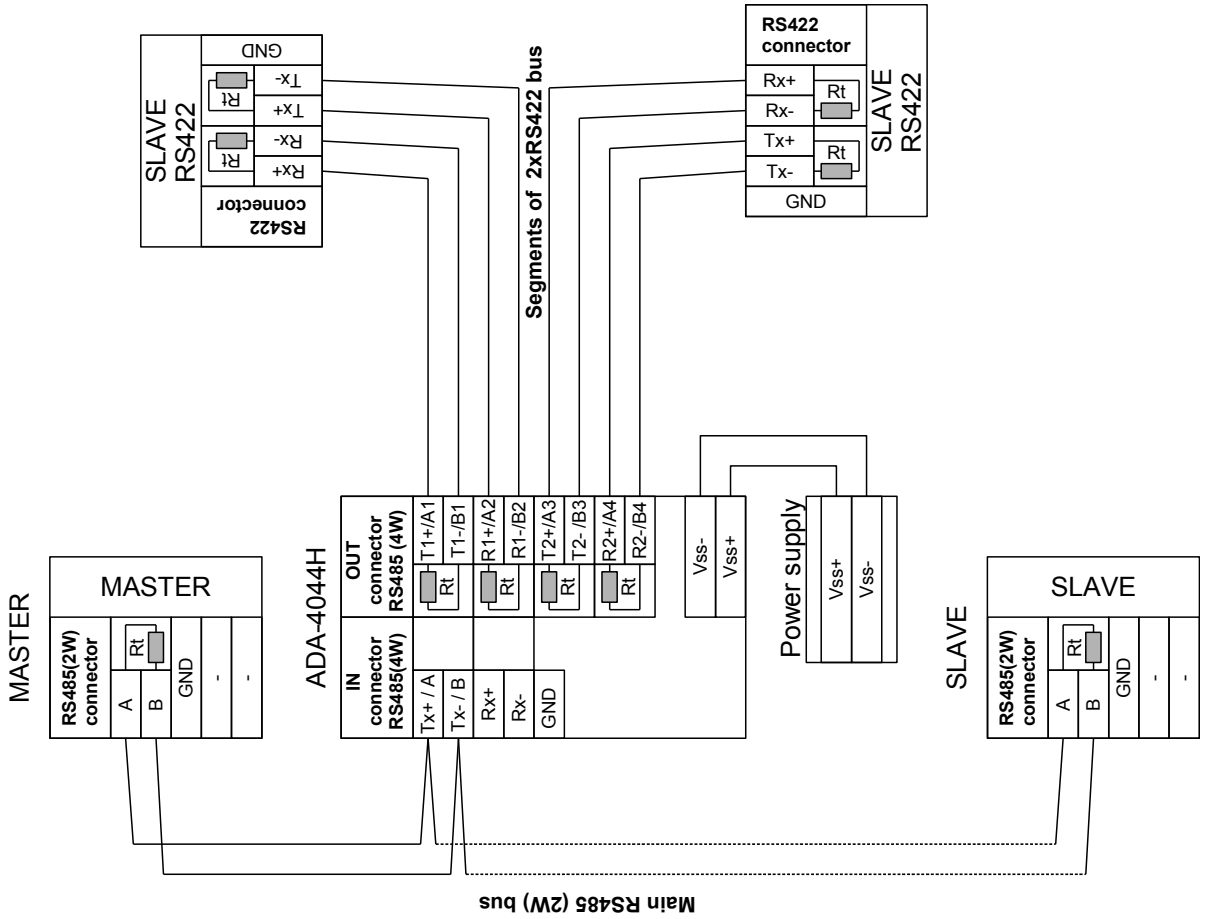

Fig 7. Star type connection of devices with RS422 interface to 2-wire RS485 bus. Conversion of 2-wire RS485 network to 4-wire RS422 network, device separation from main 2-wire network, extending the main bus by a further segments of 1200m, signal amplification.

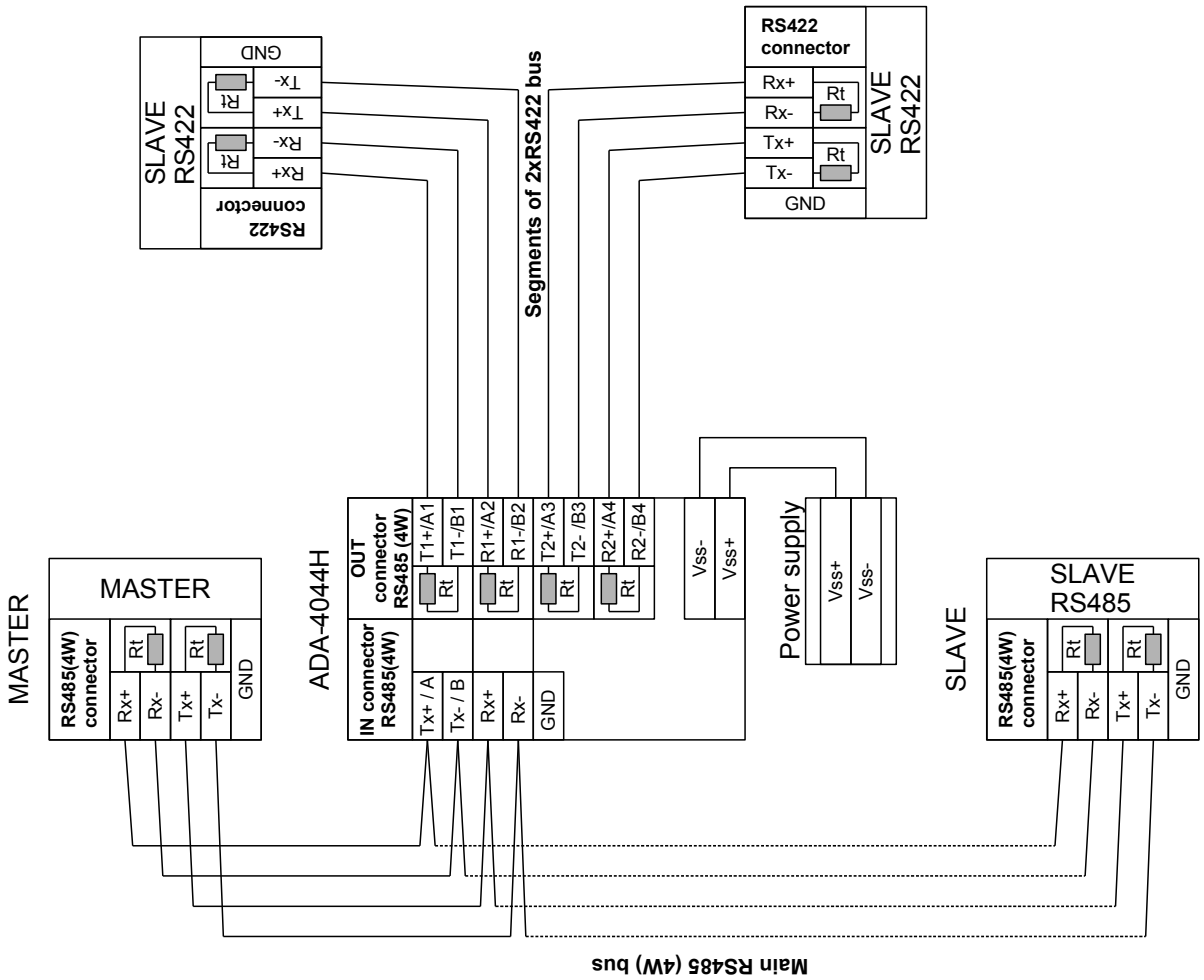

Fig 8. Star type connection of devices with RS422 interface to 4-wire RS485 network. Conversion of 4-wire RS485 network to 4-wire RS422 network, device separation from main 4-wire network, extending the main bus by a further segments of 1200m, signal amplification.

3.3. LINE TERMINATION Rt.

The application of Line Termination (terminator) Rt = 120 Ω (ohms) will reduce electrical reflection in data line at high baud rate. It is not needed below 9600Bd. The Line Termination resistor should be used if the distance is over 1000m @ 9600Bd or 700m @ 19200Bd transmission, the resistor can be necessary if there are problems with the transmission correctness. Example connection of Rt are shown on Fig. 3, 4, 5, 6, 7 & 8. Resistors Rt = 120 Ω, 5%, 0.25W of 6 pcs. are complete with the device.

3.4. POWER SUPPLY

The power supply to ADA-4044H, should be DC (regulated) from the scope 10 V= to 30V= and nominal power more then 2W. The power cable from DC power supplies to the device must not be longer than 3m. Observe the polarity, connect positive (+) of DC power supplies to V+ and negative (-) end to V- terminal. The ADA-4044H has the protection from opposite connection power supply.
If after power, on the front panel is not lit green LED PWR, check the correctness of power connection (polarity).

4. CONFIGURATION

The operating mode of the HUB ADA-4044H is set by the use 6-position SW1 switch RS485-PORTS.
The SW1 switch is located near the 5-pin screw terminal block and the RS485-PORTS switch is located on the front panel (see Fig.1)
The SW1 switch is used for changing the operating mode (RS485 or RS422) and the RS485-PORTS switch is used for changing the ports type (4x2W – four ports 2-wire or 2x4W – two ports 4-wire)
To set the SW1, should remove the terminal cover and using small, flat screwdriver make correct setting.

4.1. OPERATING MODE SETTING

All available operating modes are shows in the table below.
If there are any additional questions, please contact with technical support: suppor@cel-mar.pl or on the phone: +48 41 362-12-46.

Table 1. Setting of operating mode RS422 or RS485.

SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	Description	Operating mode
OFF	OFF	OFF	OFF	OFF	OFF	RS-422 network	4-wire RS422 network. Full duplex or half duplex transmission.
ON	ON	ON	ON	ON	ON	RS-485 network, automatic data flow control	2-wire and 4-wire RS485 network. Full duplex or half duplex transmission.

4.2. SETTING OF THE TYPE & NUMBERS RS485 OUT-PORTS

HUB ADA-4044H has on front panel the switch RS-485 PORTS (see fig.1), which is use for selection of type and numbers of RS485 ports. Available type ports: 4W – four-wire, 2W – two-wire

Setting the switch in position '4W' there are available 2 ports 4-wire (full duplex transmission) labeled as:
- port-1, signals: T1+, T1-, R1+, R1-,
- port-2, signals: T2+, T2-, R2+, R2-.

Setting the switch in position '2W' there are available 4 ports 2-wire (half duplex transmission) labeled as:
- port-1, signals: A1, B1,
- port-2, signals: A2, B2,
- port-3, signals: A3, B3,
- port-4, signals: A4, B4.

Table 2. Setting of RS-485 PORTS switch

Location of RS-485 PORTS	*Port type*	*Numbers of ports*	*Maximum number of connected device*
2W	2-wire RS485 port	4 ports	128
4W	4-wire RS485(4W) / RS422 port	2 ports	64 - RS485 / 2 - RS422

4.3. DEFAULT SETTING

Default setting of ADA-404H is shown in tables below - operating in RS485 mode and 4 ports of RS485 2-wire.

Table 3. SW1 setting of operating mode RS422 or RS485.

SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6
ON	ON	ON	ON	ON	ON

Table 4. Setting of RS-485 PORTS switch.

Position of RS-485 PORTS	*Port type*	*Numbers of ports*	*Maximum numbers of connected device*
2W	2-wire RS485 port	4 ports	128

5. STARTUP

HUB can be powered after proper connection according to steps above.
If connection was made properly green LED PWR on front panel of HUB should light, if not check polarization of power connection.
During correctness data transition via the HUB the LEDs Tx and Rx should blinking.

5.1. SIGNALING LEDS

LED	*Description*
PWR	Signalling of Power Supply
RX	Signalling of data receiving through HUB ADA-4044H from RS485/422 (RS485-OUT) port
TX	Signalling of data transmitting from HUB ADA-4044H through RS485/422 (RS485-OUT) port

ATTENTION!
At baud rate above 38.4 kbps the LED's Tx, Rx will light weakly during data transmission.

5.2. PROBLEMS

Problem	Solutions
PWR LED is not lights	Check polarization and parameters of connected power supply.
Rx LED lights continuously	RS485(4W)/ RS422 network. Wrong polarization on R1+ / R1-, R2+ / R2-, change polarization.
	RS485(2W) network. Wrong polarization on A1/B1, A2/B2, A3/B3, A4/B4, change polarization.
No transmission, Tx LED is blinking	RS485(4W) / RS422 network. Check the correctness of connection according to section *INSTALLATION*.
	RS485(2W) network. Check the correctness of configuration setting according to section *CONFIGURATION*.

6. VERSIONS

ADA-4044H - [ ] - [ ] - [ ]

Electronic versions:			
Basic,	**1**		
Special,	**2**		
Galvanic isolation:			
1kV= - 2-way		**2**	
1kV= - 3-way		**23**	
3kV= - 2-way		**3**	
3kV= - 3-way		**33**	
Terminal & Terminal Cover:			
Cover without inlets, screw terminal block			**1**
Cover without inlets, screw terminal block			**2**
Cover without inlets, plug-in screw terminal block			**3**

Order example:
Product Symbol: **ADA-4044H-1-2-3**
1 – basic version of electronic,
2 – 1kV= galvanic isolation,
3 – cover without inlets, plug-in screw terminal block.

7. SPECIFICATION

Transition Parameters		
Interface	**RS-485/422 (1xRS485-IN)**	**RS-485/422 (4xRS485-OUT)**
Connector	Screw terminal block - max. Ø 2,5mm^2	
Line length	1200 m	
Maximum number of connected device	Up to 32 devices – 2- wire- & 4-wire RS485 bus	Up to 64 devices – 4-wire RS485 bus, Up to 128 devices – 2-wire RS485 bus,
Maximum baud rate	Up to 230,4 kbps	
Transmission line	1-pair or 2-pair twisted cable, UTP Nx2x0,5 (24AWG), shield inside large interferences STP Nx2x0,5 (24AWG)	
Transmission type	Asynchronous full duplex or half duplex.	
Standards	EIA-485, CCITT V.11	
Optical signalization	• PWD – green LED power supply, • RX - red LED data receiving on RS485-OUT - RS485/422, • TX - yellow LED data transmission via RS485-OUT - RS485/422.	
Nominal work conditions		
Power requirements	10 - 30 V DC	
Power cable	Recommended length of power cable < 3m	
Power	2W	
Protection from reverse power polarization	YES	
Galvanic Isolation	• 2-way 1kV DC or 3kV DC between power circuit and signal line RS485/422 (RS485-IN) • 3-way 1kV DC or 3kV DC between power circuit and signal lines RS485/422 (RS485-IN and RS485-OUT)	
Optoisolation	3kV= between signal line RS485/422 (RS485-IN) and RS485/422 (RS485-OUT)	
Operating temperature	0 ÷ +23 ÷ +50°C	
Humidity	5 ÷ 95% - non-condensing	
Position during operation	Free	
Mounting	Rail mounting according to DIN35 standard / TS35.	
Electromagnetic compatibility	Resistance to disruptions according to the standard PN-EN 55024. Emission of disruptions according to the standard PN-EN 55022.	
Safety requiring	According to the PN-EN60950 norm.	
Environment	Commercial and light industrial.	
Enclosure		
Dimensions	53 x 90 x 58mm,	
Material	Noryl UL. 94 V-O	
Degree of casing protection	IP40	
Degree of terminal protection	IP20	
Weight	0,10 kg	
According to standards	DIN EN50022, DIN EN43880	
Storing and Transportation		
Storage temperature	-40 ÷ +70°C	
Humidity	5 ÷ 95% - non-condensing	

Dear Customer,

Thank you for purchasing **CEL-MAR Company** products.

We hope that this user manual helped connect and start up the **ADA-4044H HUB**. We also wish to inform you that we are a manufacturer of the widest selections of data communications products in the world such as: data transmission converters with interface RS232, RS485, RS422, USB, Current Loop, Fibre-Optic Converters and Ethernet or Wi-Fi.
Please contact us to tell how you like our products and how we can satisfy you present and future expectation.

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